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Indian Standard

SAFETY CODE FOR POWERED INDUSTRIAL TRUCKS

PART II MANUFACTURE

(First Revision)

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MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

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SAFETY CODE FOR POWERED INDUSTRIAL TRUCKS

PART II MANUFACTURE

(First Revision)

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SAFETY CODE FOR POWERED INDUSTRIAL TRUCKS

PART II MANUFACTURE

(First Revision)

0. FOREWORD

0.1 This Indian Standard (Part II) (First Revision) was adopted by the Indian Standards Institution on 28 November 1980, after the draft finalized by the Industrial Trucks Sectional Committee had been approved by the Marine, Cargo Movement and Packaging Division Council.

0.2 Industrial trucks are being extensively used in the field of materials handling. This standard lays down safety requirements for manufacture of industrial trucks for preventing damage and deterioration of trucks, lessening the risks of accidents and thereby ensuring safety of personnel.

0.3 Since the risks which arise during use cannot be entirely eliminated by mechanical safety measures, it is equally important to apply safety requirements concerning the operation and maintenance of industrial trucks which are described in Part I of this standard.

0.4 This standard was first published in 1972. The revision of this standard has been taken up to align it with ISO 3691-1977 ' Powered Industrial Trucks — Safety code ', issued by the International Organization for Standardization (ISO).

0.5 The requirements of brakes has been omitted as the same is being covered comprehensively in IS : 9701-1980*.

1. SCOPE

1.1 This standard (Part II) covers safety requirements for manufacture of all types of powered industrial trucks.

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*Brake performance of powered industrial trucks.

1.2 This standard does not cover the safety requirements for industrial tractors.

2. TERMINOLOGY

2.1 For the purpose of this standard the terms and definitions given in IS : 4660-1977* and IS : 7570-1975† shall apply.

2.2 In additions of term and the definitions given in IS: 4660-1977*, and IS : 7570-1975† the following definitions shall apply:

a) *Work Platform* — A platform designed for mounting on the elevating device of a high-lift fork truck for the purpose of providing a safe working place.

b) *Operator's Platform* — That part of the truck from which the operator normally controls the truck.

c) *Supplementary Platform* — A load-carrying platform accessible from the operator's platform designed for mounting on the elevating device of a high-lift order-picking truck.

3. INFORMATION PLATES

3.1 Powered Industrial Trucks — Every powered industrial truck shall bear a durable identification plate, permanently attached in a prominent position, which shall indicate the condition of the truck when delivered from the manufacturer, giving the following information in indelible characters.

a) *Internal-Combustion Engine Trucks*

1) Name of truck manufacturer (and importer, if required); if desired, it may also bear the manufacturer's trade-mark;
2) Type;
3) Production or serial number;
4) Unladen mass in working condition, without removable attachments but complete with fork arms in the case of a fork lift truck;
5) Capacity at maximum elevation; and
6) Capacity at one additional load centre higher than the rated load centre.

b) *Electric Trucks*

1) Name of truck manufacturer (and importer, if required); if desired, it may also bear the manufacturer's trade-mark;

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*Glossary of terms relating to powered industrial trucks (*second revision*).

†Glossary of terms relating to fork arms and attachments of fork lift trucks.

2) Type;
3) Production or serial number;
4) Mass of unladen truck without battery, without removable attachments but complete with fork arms in the case of fork lift trucks;
5) Capacity at maximum elevation;
6) Capacity at one additional load centre higher than the rated load centre;
7) Minimum and maximum allowable mass of the battery; and
8) Nominal battery voltage for which the truck system is arranged.

c) *Trucks with Attachment* — Identification plate shall also bear the following information in addition to the information given in (a) or (b) as applicable:

1) Type of attachment;
2) Mass of unladen truck in working condition without fork arms but fitted with the attachment; and
3) Capacity of the truck and attachment combinations at maximum elevation.

Note 1 — It is also permissible to indicate the manufacturer's rated capacity on the plate.

Note 2 — The load capacity may be indicated on a separate plate, if desired.

Note 3 — When a truck or attachment is imported, by other than the original manufacturer, it is the responsibility of the importer to affix an additional plate bearing his name.

3.2 Removable Attachments

3.2.1 Every removable attachment shall carry a separate identification plate giving the following information:

a) Name of attachment manufacturer (and importer, if required);
b) Type;
c) Production or serial number;
d) Mass of the attachment and distance of its centre of mass from the attachment mounting face; and
e) Rated capacity of the attachment.

Note — The following warning shall be added:

'WARNING — Actual load may be restricted by reference to the capacity of the truck or capacity of the attachment whichever is less'.

3.3 Batteries for Electric Trucks

3.3.1 The traction batteries shall carry an identification plate showing:

- a) Name of battery manufacturer;
- b) Type;
- c) Serial number;
- d) Nominal voltage;
- e) Capacity in ampere hours at the 5-hour rate; and
- f) Mass in working order with removable container (and ballast), if used.

Alternatively, the mass of the battery may be stamped on the removable container (and ballast) near the lifting means.

3.4 Special Use

3.4.1 If a truck is to be operated under conditions other than the normal working conditions as specified in IS : 7552-1974*, it shall bear a durable plate, in a prominent position, giving the following information:

- a) Designation of the special condition(s) of use, and
- b) Capacity for each one of the special conditions of use.

4. STABILITY REQUIREMENT

4.1 Powered industrial trucks shall be tested in accordance with IS : 4357-1974†, IS : 7309-1973‡, IS : 7552-1974*, IS : 7631-1975§ and IS : 9075-1979‖ as applicable.

5. BRAKE PERFORMANCE

5.1 The brakes fitted on powered industrial trucks shall meet the performance requirements setforth in IS : 9701-1980¶.

6. DIRECTION OF TRAVEL CONTROLS

6.1 Direction of travel-controls shall be in accordance with IS : 7496-1974**.

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*Stability tests for trucks operating in special conditions.

†Methods for stability testing of fork lift trucks (*first revision*).

‡Stability tests for reach and straddle fork lift trucks.

§Stability tests for pallets stackers and high lift platform trucks (pedestrian and rider controlled).

‖Stability tests for side loader trucks.

¶Brake performance of powered industrial trucks.

**Direction of travel controls for industrial tractors and powered industrial trucks.

7. CONTROL SYMBOLS

7.1 Symbols when used on powered trucks shall be in accordance with IS : 7553-1975*.

8. REQUIREMENTS FOR POWER SYSTEMS AND ACCESSORIES FOR INDUSTRIAL TRUCKS WORKING IN NON-HAZARDOUS ATMOSPHERES

8.1 Internal Combustion Engine Driven Trucks [Diesel, Petrol and Liquid Petroleum Gas (LPG)]

8.1.1 *Exhaust and Cooling Systems* — The exhaust system shall be arranged with due consideration for the comfort and well-being of the operator and other personnel. The air flow through the cooling system shall also be arranged in a manner to avoid discomfort to the operator.

8.1.2 *Fuel Tank*

8.1.2.1 A fuel tank shall not be located directly over the engine. If a tank is within or contiguous to the engine compartment, the tank and/ or fill arrangement shall be isolated from the electrical and exhaust systems by a separate enclosure or by baffles.

8.1.2.2 The tank location and the facilities for filling shall be such that spillage or leakage will drain to the ground and not on to the engine or onto electrical or exhaust-system parts, or into the operator's compartment. Fuel spillage shall not be possible under operating conditions.

8.1.2.3 A fuel tank and fill fitting shall be so located as to minimize the possibility of damage to the tank or its fittings.

8.1.3 *Fuel-System Components* — All fuel-system components shall be firmly secured to the truck and the fastenings arranged to minimize the effects of vibration.

8.2 Additional Requirements for Internal Combustion Engine Driven Trucks Using LPG

8.2.1 *Containers*

8.2.1.1 The container(s) for LPG shall be either permanently fixed on the truck or quickly removable. The container(s) shall conform to IS : 3198-1974† or IS : 7142-1974‡ depending on their capacity.

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*Control symbols for powered industrial trucks

†Welded low carbon steel gas cylinder exceeding 5-litre water capacity for low pressure liquefiable gases (*second revision*).

‡Welded low carbon steel gas cylinders for low pressure liquefiable gases, not exceeding 5-litre water capacity.

8.2.1.2 Containers shall be fitted on the truck in such a manner as to be protected against atmospheric corrosion, corrosion and from corrosive action of the products handled by the truck.

8.2.1.3 The containers shall be firmly secured to the truck and the fastening shall be unaffected by vibration.

8.2.1.4 Containers, whether fixed or removable, shall be equipped with a device to prevent the sudden omission of a large volume of gas, particularly in the case of a pipe failure. The fuel take-off on the container shall be equipped with an easily accessible, manually operated valve. The fuel shall be taken off in liquid form unless the container and the engine are specially equipped for direct vapour withdrawal.

8.2.1.5 All containers shall have the following fittings:

a) A suitable safety pressure-relief valve connected to the vapour space of the container. Where such containers are fitted inside compartments of vehicles, the discharge side of the relief valve shall be piped to atmosphere;

b) A fixed maximum-level indicating device; and

c) Where containers are fitted inside compartments of vehicles, the discharge side of any maximum-level indicating device which relies on bleeding gas to atmosphere shall terminate at a readily visible position on the outside of the vehicle.

   1) The maximum-level indicating device which relies on bleeding to atmosphere shall be designed so that the bleed hole is not larger than 1·5 mm diameter and also that the parts of the device cannot be completely withdrawn in normal gauging operations.

   2) All maximum liquid-level devices shall be suitable for the LPG in use and shall indicate the maximum product level which shall not exceed that permitted by regulations.

   3) If a liquid-level gauge is fitted, it shall not vent to atmosphere.

8.2.1.6 If containers are installed in a compartment, this compartment shall have permanent openings at the top and bottom allowing adequate ventilation to outside atmosphere.

8.2.1.7 When containers are removable, their fastening shall permit easy handling and easy checking of installation after the exchange of containers.

8.2.1.8 When removable containers are installed, they shall be so located on the truck that the safety pressure-relief valve opening is always in communication with the vapour space (top) of the container.

This may be accomplished by an indexing pin which positions the container when the container is properly installed.

8.2.1.9 If a spare or additional container is carried on the truck, it shall be secured in an approved fitting in accordance with **8.2.1.3** and **8.2.1.8**.

8.2.1.10 It is recommended that weatherproof caps be provided in order to protect connections when containers are stored in the open.

8.2.2 *Piping*

8.2.2.1 Connecting piping and all associated parts shall be easily accessible, protected against damage and wear, and flexible enough to withstand vibration and deformation in service. Pipe work shall be so arranged that damage or leaks are easily detectable and shall be installed in such a way that it cannot be damaged by the hot parts of the engine. Fully rigid pipes for connecting the container to equipment on the engine shall not be used.

8.2.2.2 Hoses and all connections shall be capable of withstanding a pressure of 30 bar. They shall be replaced at the first indication of damage or deterioration.

8.2.2.3 The container and its connections shall be installed in such a way that there are no projections outside the overall contour of the truck. Container connections shall be protected by a rigid guard.

8.2.2.4 Any section of pipework containing LPG between two shut-off valves, which may be closed, shall be protected against excessive pressure by means of a suitable pressure-relief valve.

8.2.2.5 The use of aluminium piping in the liquid lines is not permissible.

8.2.3 *Equipment*

8.2.3.1 The supply of gas shall be automatically cut off when the engine stops, whether or not the ignition systems has been switched off.

8.2.3.2 For multi-fuel applications the system shall be designed to avoid the possibility of LPG entering any other fuel container, and each fuel source shall be cut off before the alternative one is opened.

8.2.3.3 Equipment shall be installed in such a manner that a safety pressure-relief valve or a liquid-level indicator cannot discharge on truck components which may be a source of ignition.

8.2.3.4 If corrosion would interfere with the proper functioning of a part, the part shall be provided with a corrosion-resistant protective coating.

8.3 Battery Powered Trucks

8.3.1 *Battery*

8.3.1.1 An air space of at least 30 mm shall be provided above the live terminals of the battery, or the cover shall be provided with a insulated lining. The metal cover (of the battery or the battery compartment) where the mass of operator rests shall have such strength and rigidity that, in conjunction with the air spacing provided between it and the battery terminals, the battery terminals, are not short-circuited when a force of 980 N is applied to an area 300 × 300 mm square located at the geometric centre of the cover. Insulation, if used, shall be secured to the inner surface of a metal cover for the battery compartment.

8.3.1.2 Ventilation holes shall be provided in the battery container or compartment above the cells.

8.3.1.3 If there are openings in the cover they shall be protected against the entrance of foreign bodies. The cover shall be rigid enough to obviate, in normal use, any distortion which might bring it into contact with live parts of the cells.

8.3.1.4 Batteries and containers shall be retained in the truck in such a manner as to prevent displacement during normal use.

8.3.2 *Charging Connectors* — Charging connectors shall be arranged so that the battery is isolated from the various working circuits of the truck while it is being charged.

8.3.3 *Electrical Equipment* — When the truck is in operational condition, live parts shall be protected against accidental short-circuiting.

8.3.4 *Resistors* — All resistors shall be located so as to avoid overheating and damage.

9. REQUIREMENTS OF POWER SYSTEMS AND ACCESSORIES OF INDUSTRIAL TRUCKS WORKING IN HAZARDOUS AREAS

9.1 All industrial trucks for use in hazardous areas shall meet the requirement as given in IS : 8790 (Part I)-1978* and IS : 8790 (Part II)-1978†.

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*General requirements of powered industrial trucks working in hazardous areas: Part I Internal combustion engine powered trucks.

†General requirements of powered industrial trucks working in hazardous areas: Part II Electric battery powered industrial trucks.

10. SYSTEMS AND COMPONENTS FOR LIFTING, FITTING AND OTHER MOVEMENTS

10.1 Lifting Devices

10.1.1 *Mechanical Lifting Devices*

a) Chains, wire ropes and other securing elements, when used in lifting devices, shall be of sound material and adequate strength and shall be free from visible defects. The safety factor for chain shall be 4 (minimum) and for wire ropes and other securing elements shall be 6 (minimum).

b) Evaluation of fork arms shall be made on the basis of the requirements given in IS : 6876-1972* on each fork.

c) Fork carriages and fork arms shall be designed and manufactured in such a way that unintentional detachment of the fork arms from the fork carriage is prevented and unintentional lateral displacement or lateral detachment of the fork arm is prevented.

d) Attachments shall be designed and manufactured in such a way that unintentional detachment from the fork carriage as well as lateral displacement is prevented.

e) Power driven lifting and lowering devices shall be equipped with means to prevent over travel of the load carrier.

10.1.2 *Hydraulic Lifting Devices*

a) Lifting and lowering speeds shall be variable and under control of the operator, except when a solenoid control is employed.

b) In the case of a break in hydraulic tubing system, the lowering speed of the load carriage shall not under any circumstances exceed 1·0 m/s.

10.2 Tilting Devices

10.2.1 The tilting speed of the mast shall be variable and under control of the operator, except when solenoid value is employed.

10.3 Attachments

10.3.1 The movement of the attachment shall be variable and under the control of the operator, except when a solenoid control is employed.

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*Technical characteristics and testing of fork arms for fork lift trucks.

10.4 Hydraulic Systems

10.4.1 *Hoses, Piping and Unions* — These shall be of sound material and adequate strength so as to withstand a burst pressure not less than four times the operating pressure, and shall be free from visible defects.

10.4.2 *Relief Valve* — All hydraulic systems shall be equipped with a pressure relief valve. If the relief valve is adjustable, it shall include means to protect it against both accidental loosening and unauthorized adjustment.

11. PROTECTIVE DEVICES

11.0 General — This clause specifies requirements for protection of the operator and also applies equally to any passengers' places provided on the truck.

11.1 Operator's Location — The operator's location shall be arranged and designed so that the operator remains within the plan outline of the truck when he is in his normal operating position.

Exceptions are:

a) Trucks having provision for pedestrian control;

b) The operator's location shall allow easy access and egress for the operator; and

c) The floors and steps shall have slip-resistant surfaces.

NOTE — For the purpose of the clause, the term 'operator's location' includes the location for a standing or a seated operator.

11.1.1 *Protection of Operator*

a) Reasonable precautions shall be taken to minimize the risk of injury to the operator from moving parts when he is in his normal operating position. Such precautions shall be designed so that they do not unduly interfere with the operator's vision or freedom of movement, or both;

b) The operator, when in his normal operating position, should be protected from crushing, shearing and trapping points on the mast using the following clearances:

Trapping Points	*Clearances*
Fingers	25 mm
Hands or Feet	50 mm
Arms or Legs	100 mm

c) Guarding may be used instead of these clearance dimensions.

11.2 Overhead Guards — High lift rider trucks shall be equipped with an overhead guard or shall have provisions for the attachment of guard except where the operating conditions proclude the use of overhead guards.

11.3 Load Backrest Extension — High-lift trucks shall be designed so that they may be equipped with a load backrest extension.

11.4 Operator's Platform

11.4.1 All operator's platforms on end-controlled trucks shall extend beyond the operator's position and be so designed that they withstand a compression force corresponding to the weight of the laden truck and applied along the longitudinal axis of the truck with the outmost projection of the platform against a flat vertical surface.

Note — For the purpose of this clause, the term 'operator's platform' includes any surrounding reinforcement or parts of the truck which provide resistance to crushing of the platform.

11.4.2 Operator's platforms which overhang the truck shall be provided with guards at the side or front of the platform.

Exception — Trucks having provision for pedestrian control.

11.4.3 Operator's platforms which fold or pivot shall be equipped with provisions to prevent the unintentional folding or pivoting of this platform when the operator is standing on it.

11.4.4 Operator's platforms which are at or can be elevated to a height greater than 1 m above the ground shall be equipped with rails.

11.4.5 Rails shall be not less than 900 mm or more than 1 100 mm high measured from the upper surface of the rail to the platform and shall be capable of withstanding a force of 900 N applied in any horizontal direction. Removable or hinged rails shall be constructed in such a manner that proper rail positioning is easily accomplished and a secured position is visibly discernible.

11.4.6 When a supplementary platform (for example order-picking platform) is used, the rail on the open (load) side of the operator's platform may be omitted. When removable or hinged rails are provided or the rail on the open (load) side is omitted, other restraining means to protect the operator from falling shall be provided.

11.4.7 Means shall be provided to protect personnel in their normal working position from those moving parts of the truck which may represent a hazard.

11.5 Work Platforms

11.5.1 Work platforms (such as for maintenance purposes) used for elevating personnel shall be provided with means for attaching and securing the work platform to the elevating device.

11.5.2 Work platforms shall be provided with a slip-resistant surface, rails on the free side which meet the requirements of **11.4.4**, the boards having a minimum height of 100 mm on all sides, and guard against those moving parts of the truck which may represent a hazard.

11.6 Wheel Guards

11.6.1 Tyres which extend substantially beyond the confines of the truck chassis shall be effectively guarded to minimize the risk of injury to the operator, when he is in the normal operating position, from objects thrown up by the tyres.

11.7 Working Devices

11.7.1 Rider-controlled industrial trucks shall be equipped with a clearly audible warning device.

BUREAU OF INDIAN STANDARDS

Headquarters:
Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002
Telephones: 323 0131, 323 3375, 323 9402
Fax : 91 11 3234062, 91 11 3239399, 91 11 3239382

Telegrams : Manaksanstha
(Common to all Offices)

***Central Laboratory*:**	**Telephone**
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